

# **Department of Mechanical Engineering**

**NIT Srinagar**

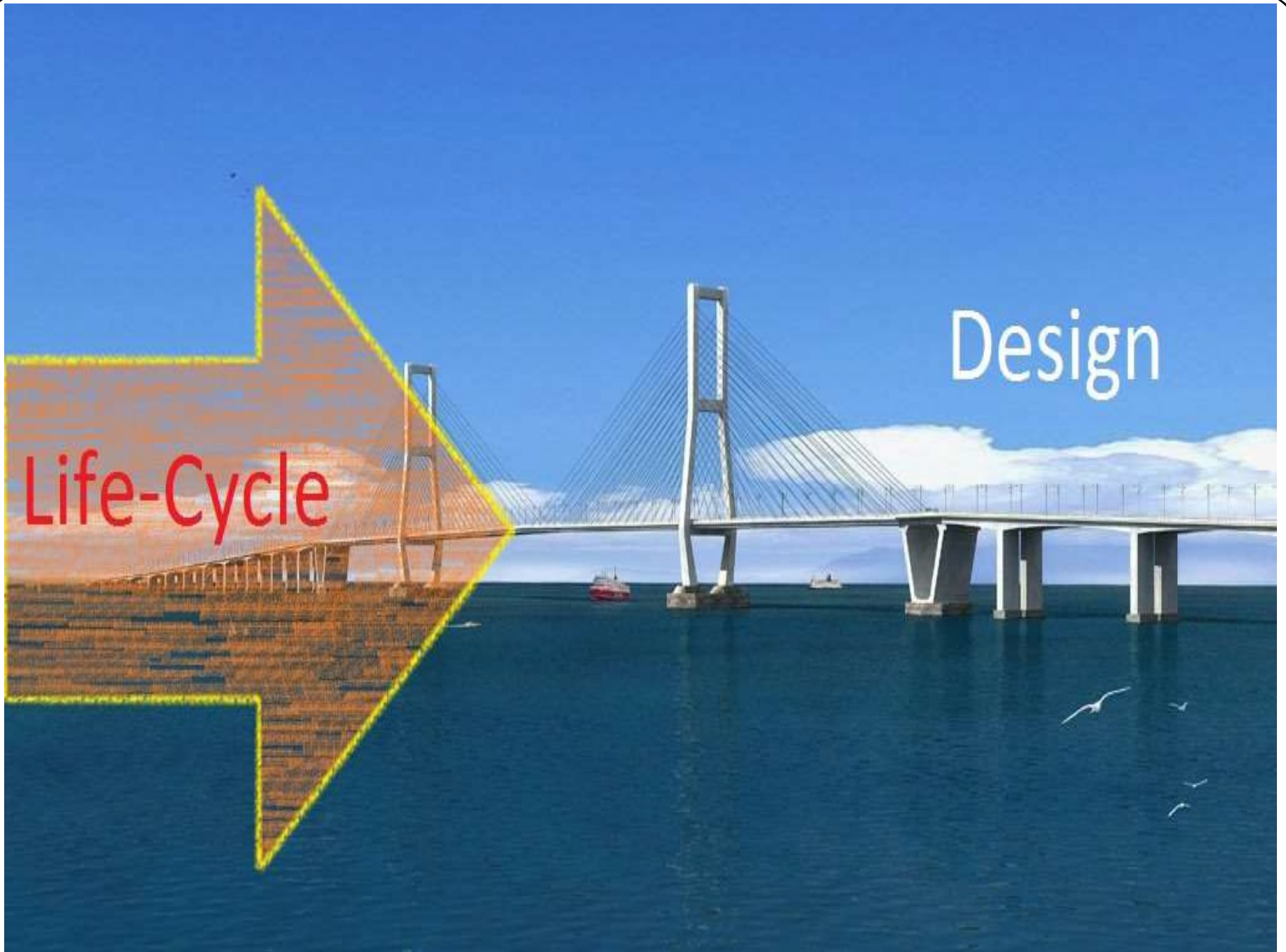
**Lecture By- Dr. Abhijit Dey**

# Content

- Introduction
- Concepts
- Analysis & Design
- Life cycle engineering
- Concurrent design engineering
- Decision making model & Process
- Fuzzy decision making model



Design



# Concepts

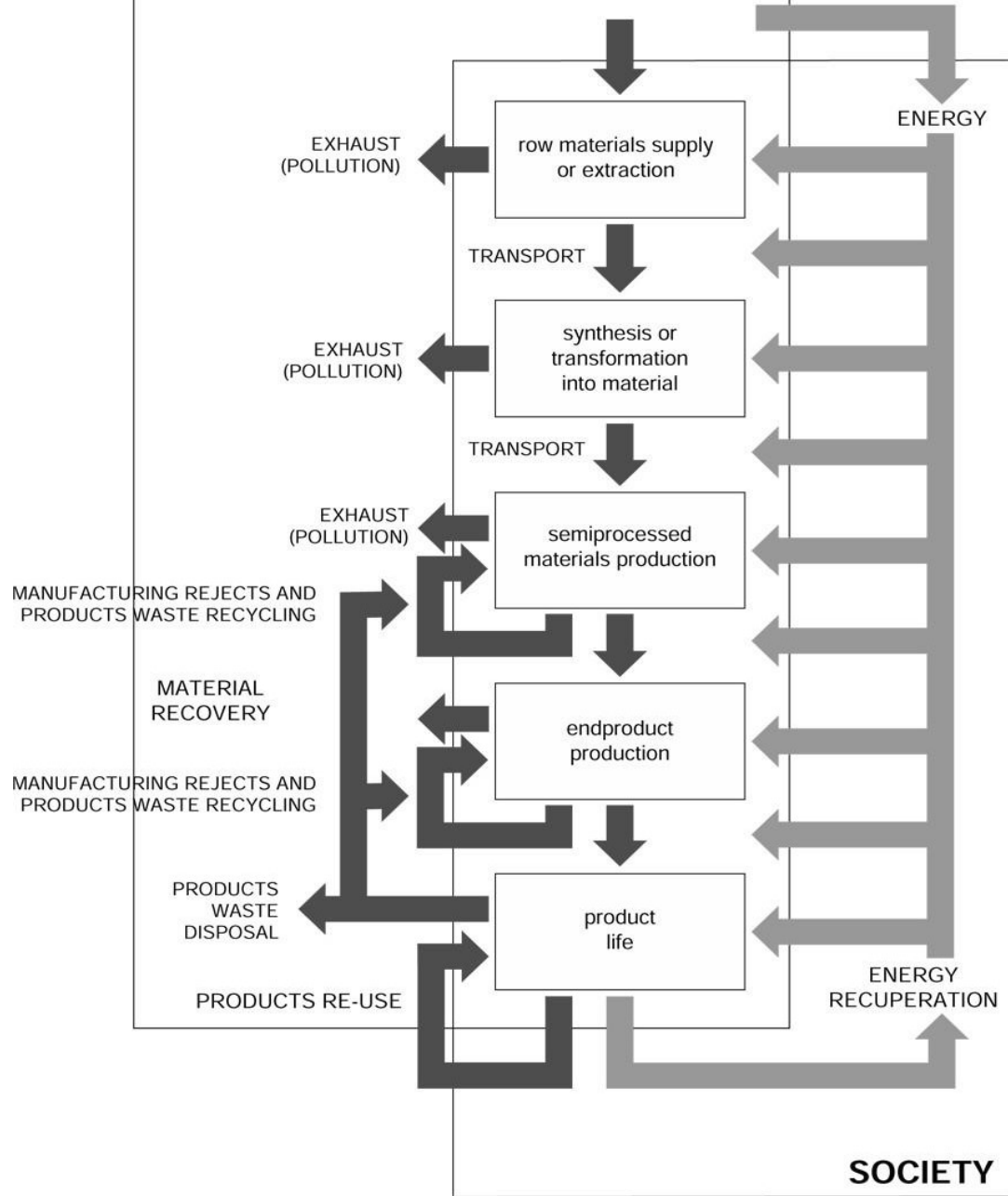
## ❖ **The Idea of Life Cycle Design**

- Basically, this design approach is based upon the main idea that structures suffer Degradation over time, thus reducing its initial safety ranges.

# LCD approach to develop new industrial products

- The Life Cycle Design (LCD) is one of the **several methods – sometimes just ideas–** (including: “Eco Design”, “Environmental Design”, “Green Design”, “Sustainable Design” etc.) that have been **suggested to address the environmental crisis, in terms of product design.**
- **The LCD method is based on the “Life Cycle Assessment” (LCA).** This means that, **before you design a new product, it is necessary to verify the assessment of its entire lifecycle, extending the assessment to what precedes and follows the smaller industrial process .** The so-called "assessment" must **indicate and solve critical points** from the perspective of (environmental) sustainability. (→□)

**ENVIRONMENT**



# Targets of LCD compared to raw materials needed for industrial production

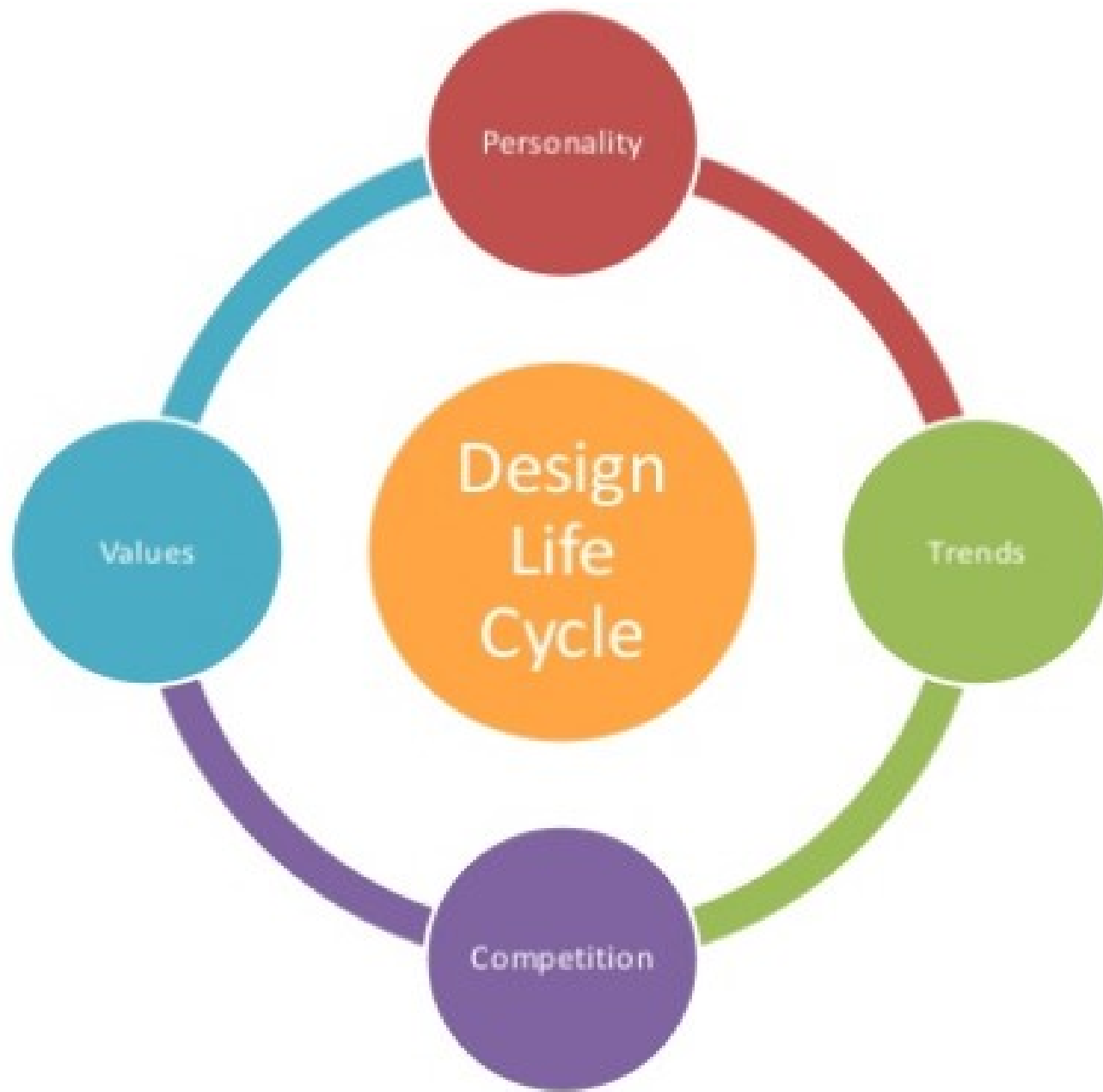
A designer may help **reduce the raw materials needed** for:

- **Products production** (e. g. the material used for unuseful parts; e. g. the material wasted because not “recyclable”);
- **Products packaging production** (e. g. the packaging not needed for some products, like some fruits or vegetables);
- **Directly induced consumption** (e. g. design of disposable products, when it is not essential, like instead for medical use or to preserve drink and food) **or caused by induced behaviour** (e. g. design of containers to collect specific kinds of material who can

**Targets of LCD compared to raw materials needed for industrial production: many components, like a car spoiler, can be unuseful and just a marketing strategy**



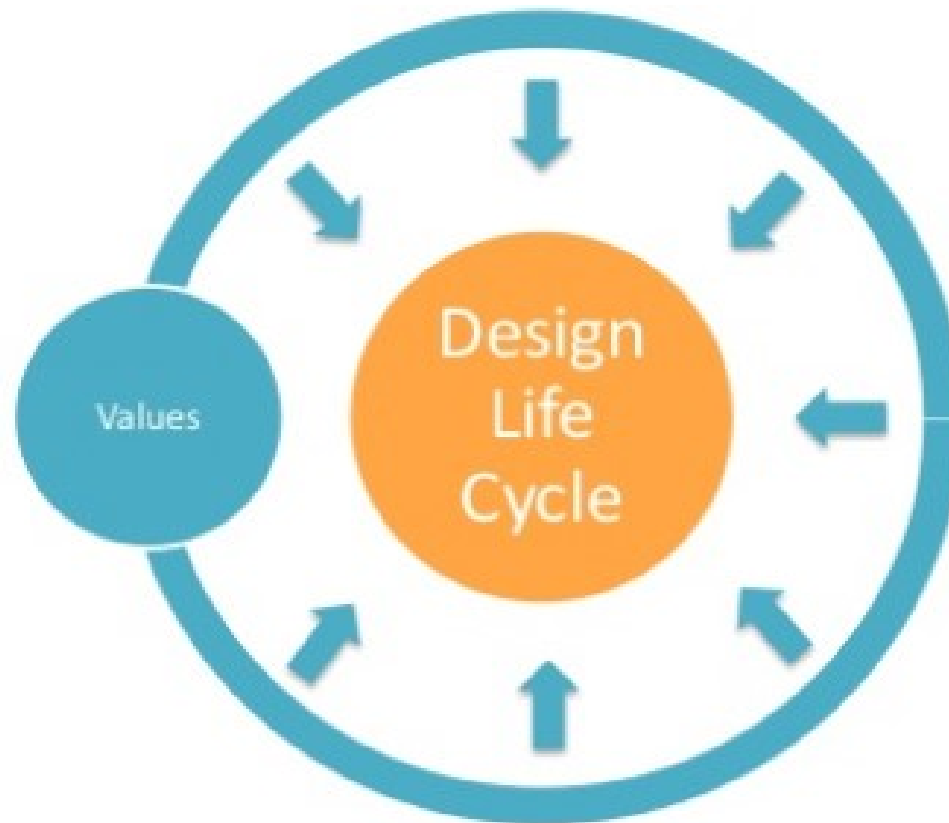




## What are values?

- Values are the basic convictions an individual. Values result in a specific mode of conduct which contributes to one's desires and state of existence.

# How do values affect design longevity?



Values have Long term **Influence**

# Values have influence

Values lay the foundation for the understanding of attitude and stimulus because because they influence one's perception and behaviour

# Values take Precedence over trend

They are generally not fluid and flexible .

They tend to be relatively stable and enduring

## **Why is it important for designers to understand consumer's values?**

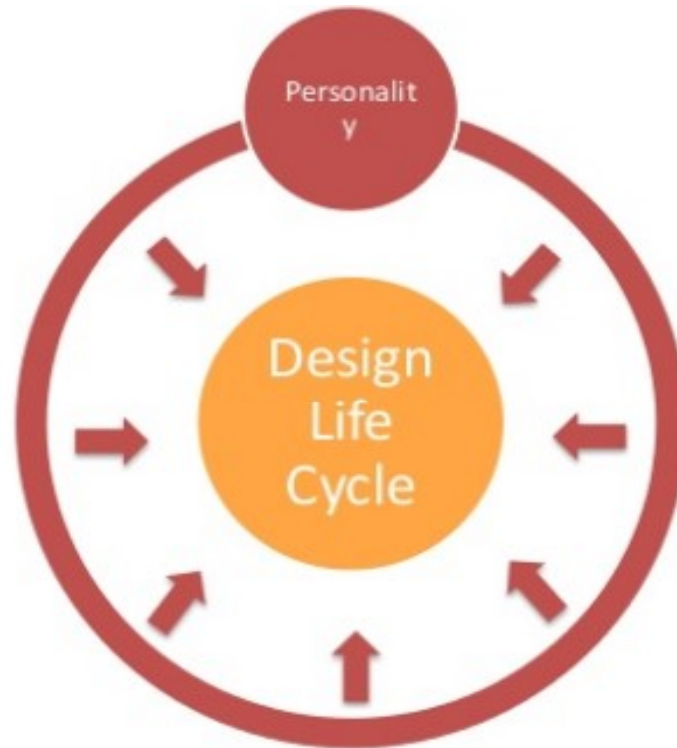
It helps designers work backwards. And be able to determine an individual's background by observing the values they display and vice versa.

It also helps designers work forwards. It can be a valuable aid in explaining and predicting behaviour.

# **What is Personality?**

**Personality is the sum total of the ways that an individual reacts to and interacts with others.**

# How does personality affect design longevity



Personality determines **Reaction**



**Why is it important for designers to understand consumers personalities.**

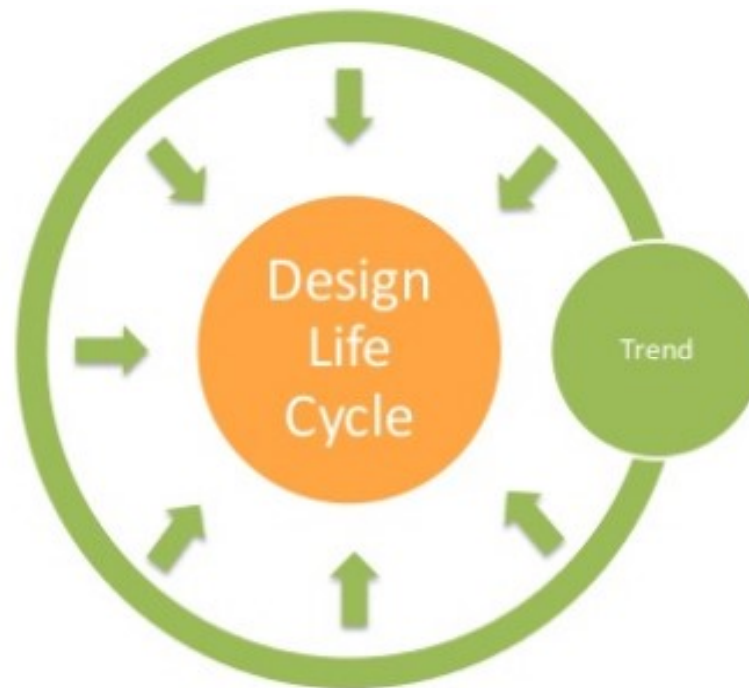
When you understand why people react the way they do, you are able to determine what they will react to and design along those lines.

# What is a Trend?

Trends are dominant and prevailing mindsets or habits in society over a particular period of time.

A general tendency or inclination.

# How do trends affect design longevity?



Trends have Short term **Influence**

**Why is it important for designers to take into consideration current trends?**

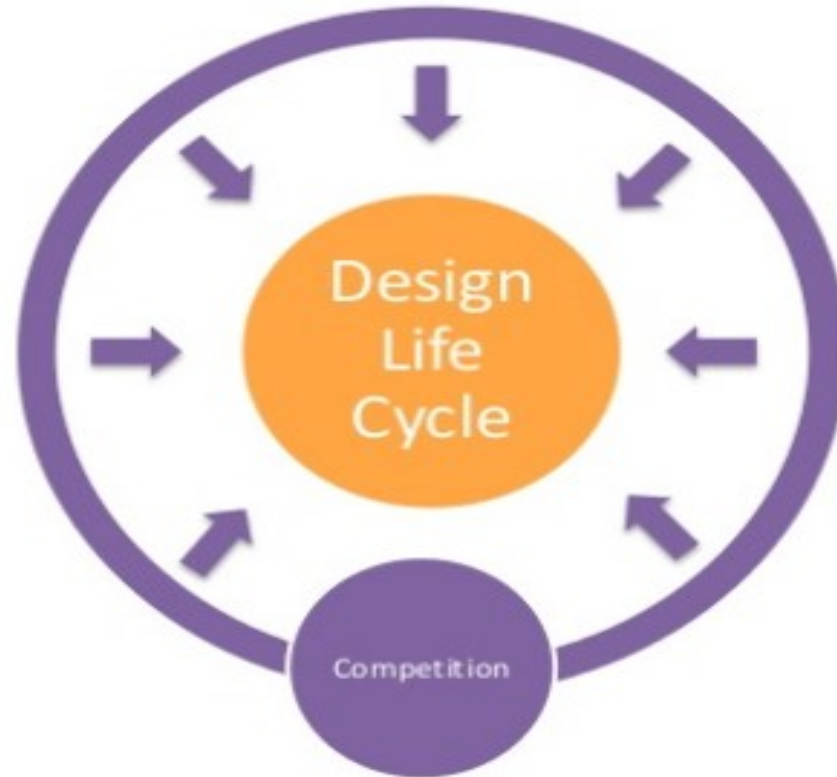
Trends reflect what people are thinking on a daily basis.

# What is Competition?

Your Competition are ones that service similar primary needs.

Competition results in Comparison.

# How does competition affect design longevity?

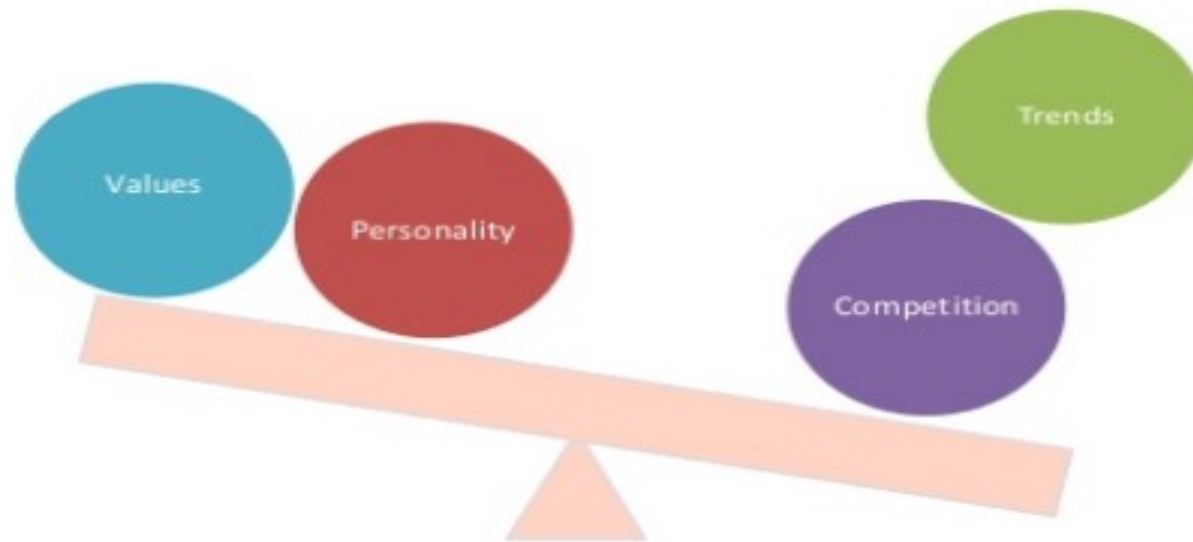


Competition affects  
**viability/stability**

# Find balance between

Long term  
influences

Short term  
influences



## Targets of LCD compared to energy resources needed

- A designer may help **reduce the energy needed** for:
- **Collection or extraction of raw materials;**
- **Transformation of raw materials into industrial materials;**
- **Production of the components;**
- **Assembling of the product** (if not monocomponent);
- **Packaging of the product;**
- **Material, components and product transportation and distribution;**
- **Use of the product in terms of duration or induced directly** (e. g. a product that, because of its brief life, must be substitute in a short time; e. g. the energy consumption of a lamp) **or caused by induced behavior** (the energy consumption due to a pot



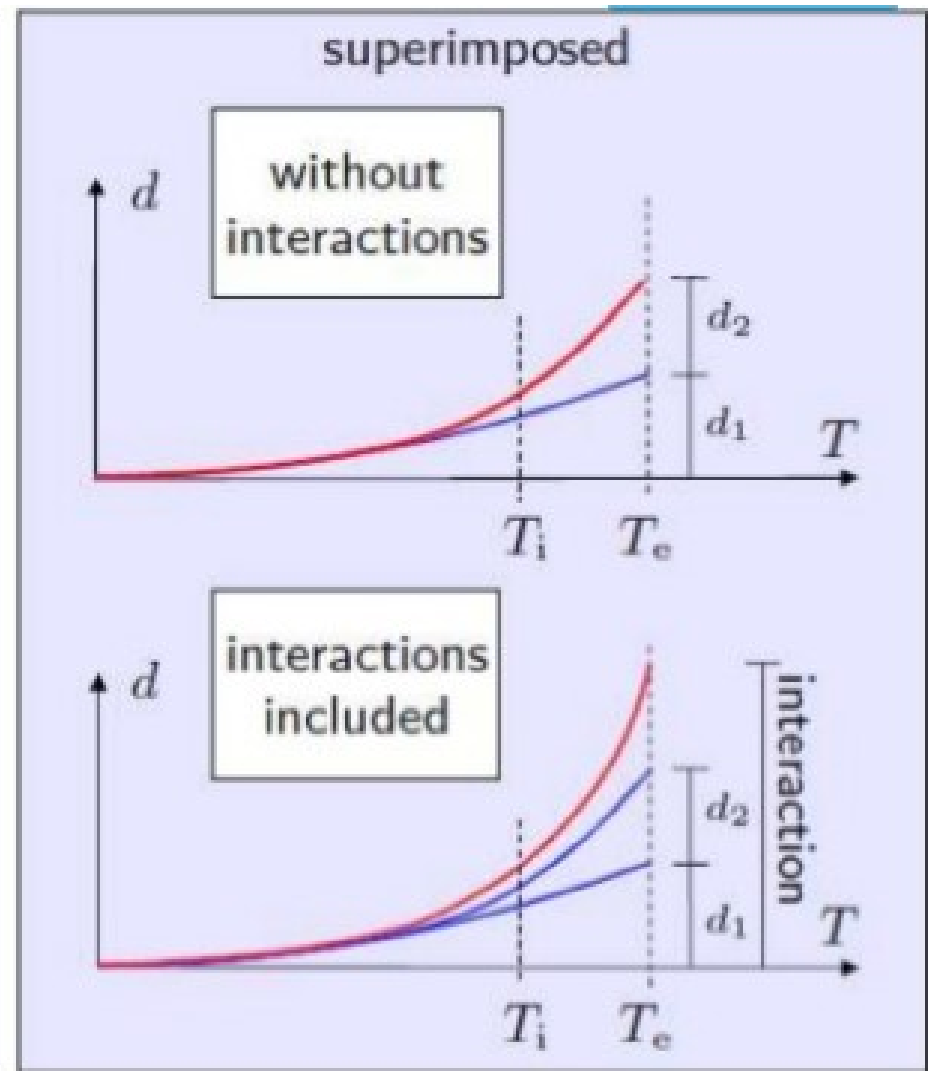
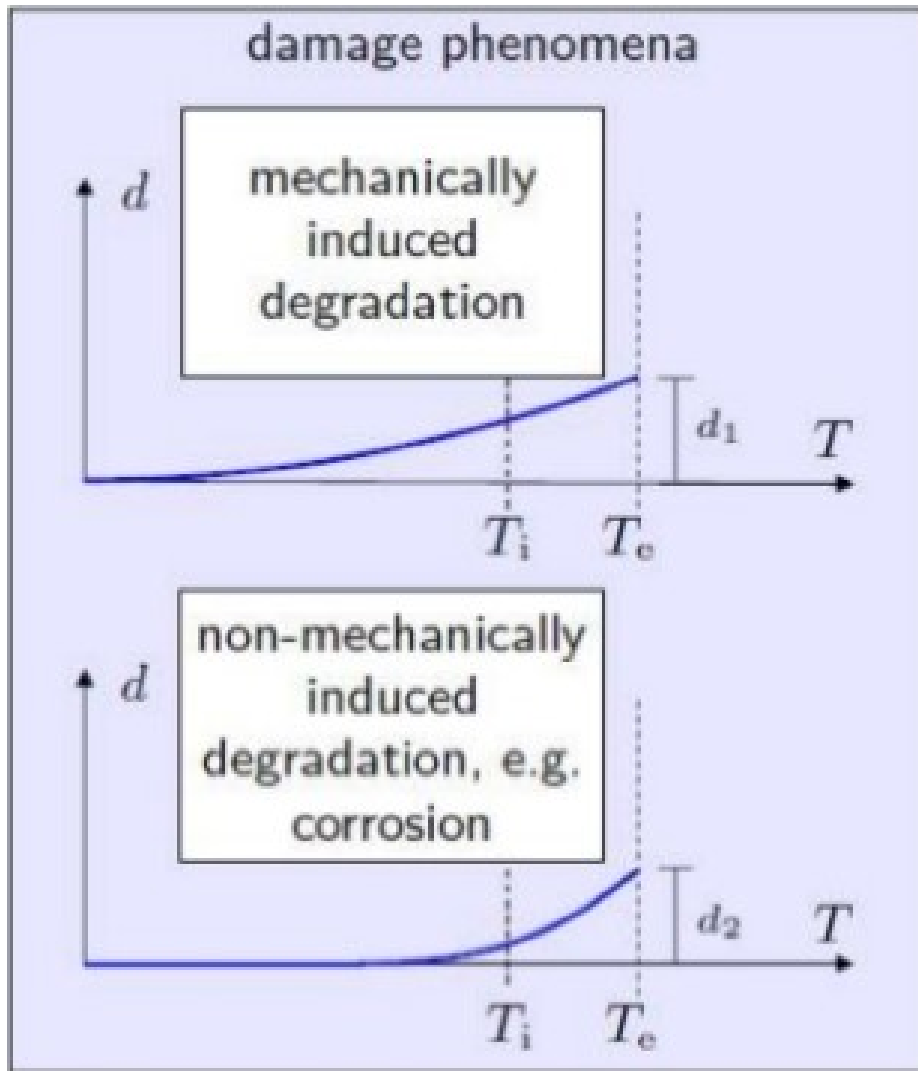
**Targets of LCD compared to energy resources needed:** Offshore oil and natural gas extraction is energetically very expensive and critical, especially for the catastrophic environmental damage that may occur



**For Life-Cycle Design we have to consider the followings:**

- Structure Degradation
- Resistance Alterations
- Safety Reduction

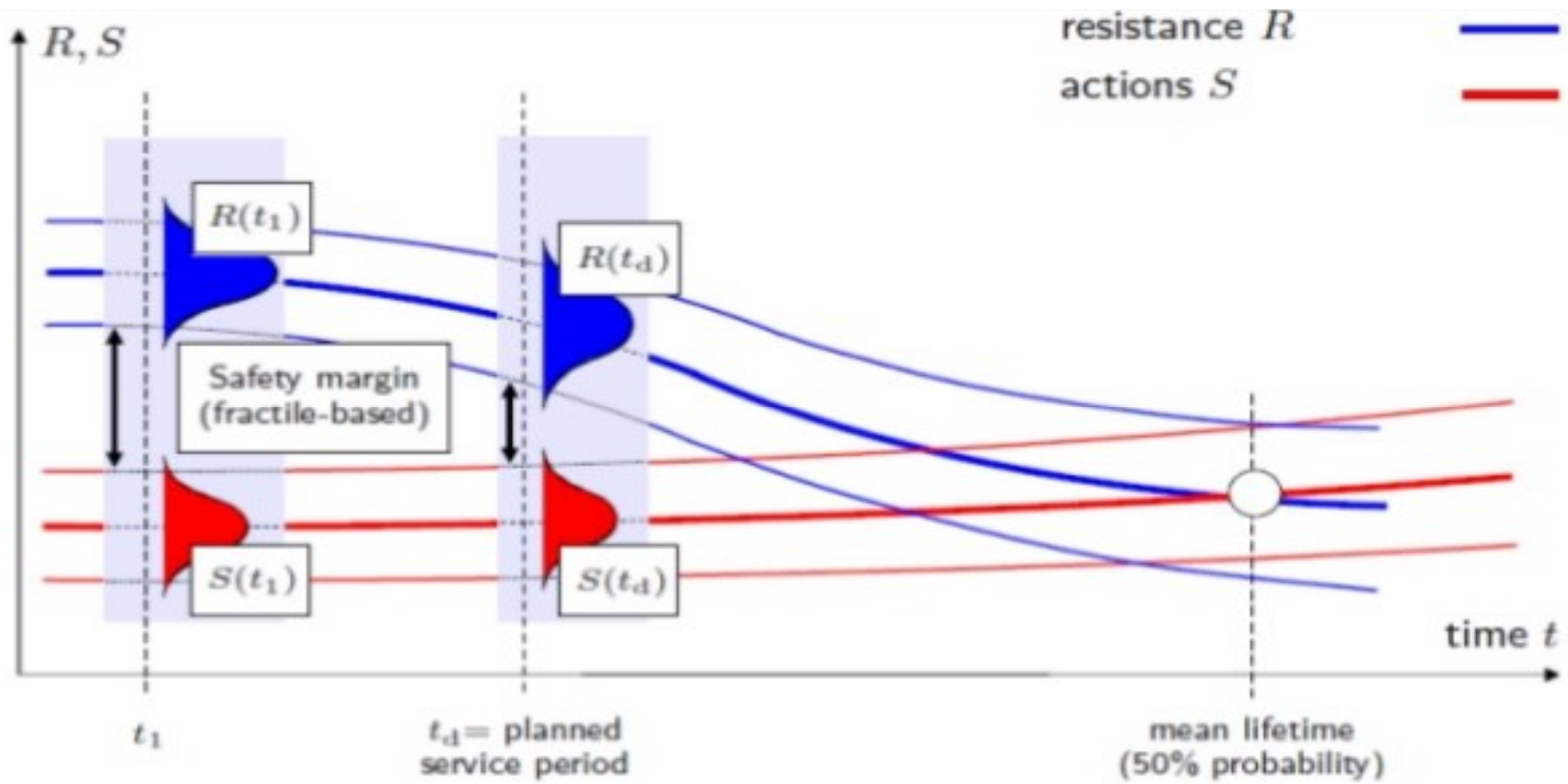
# Structure Degradation



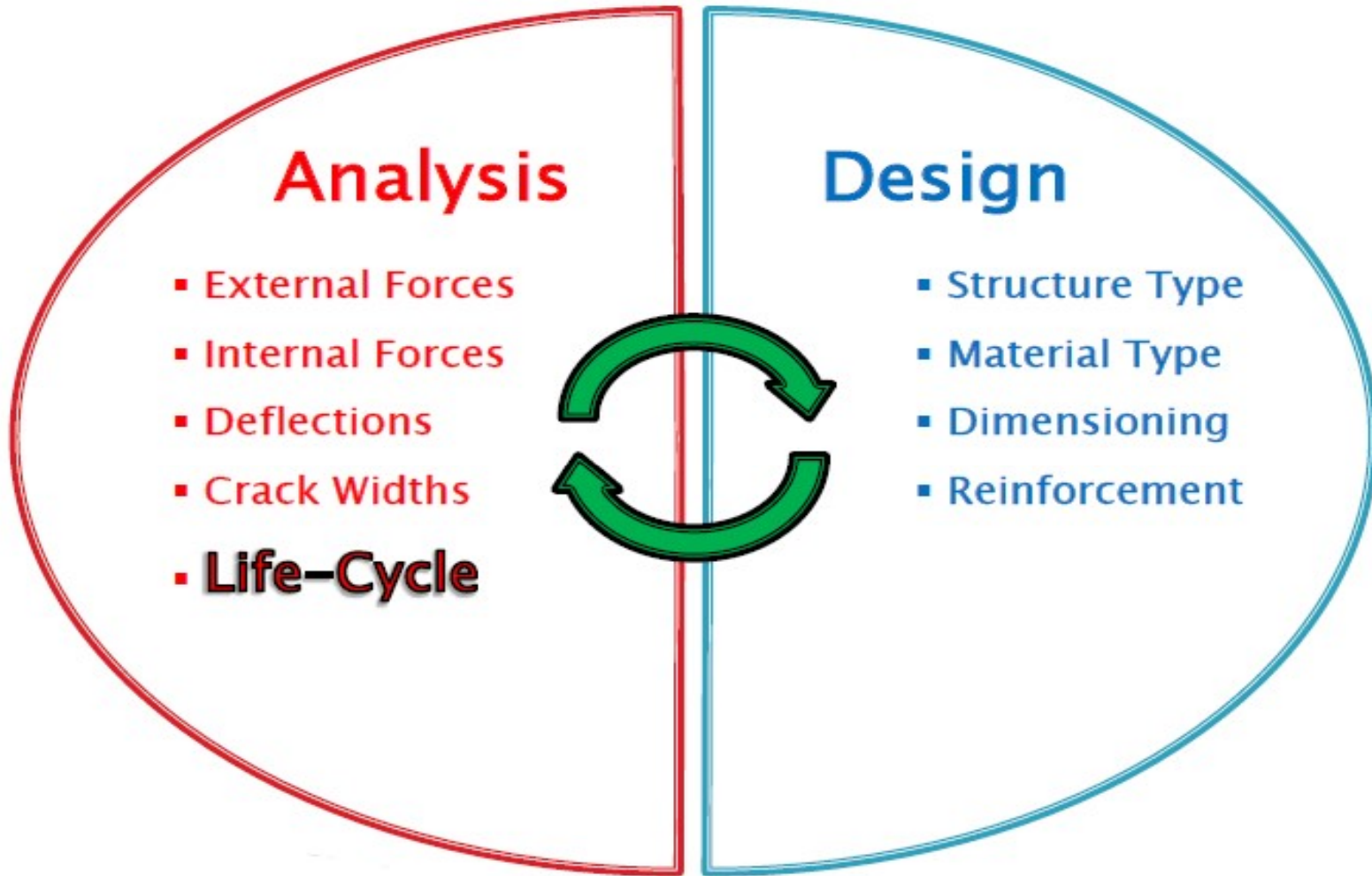
# Resistance Alterations

- 
- Fatigue
  - Cracking
  - Corrosion
  - Cycling Loads
  - Temperature

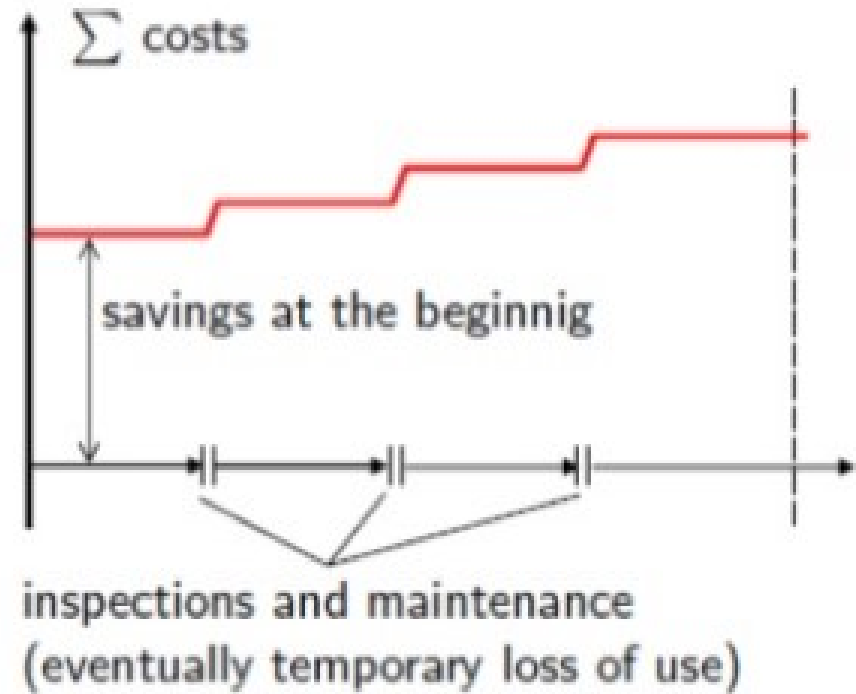
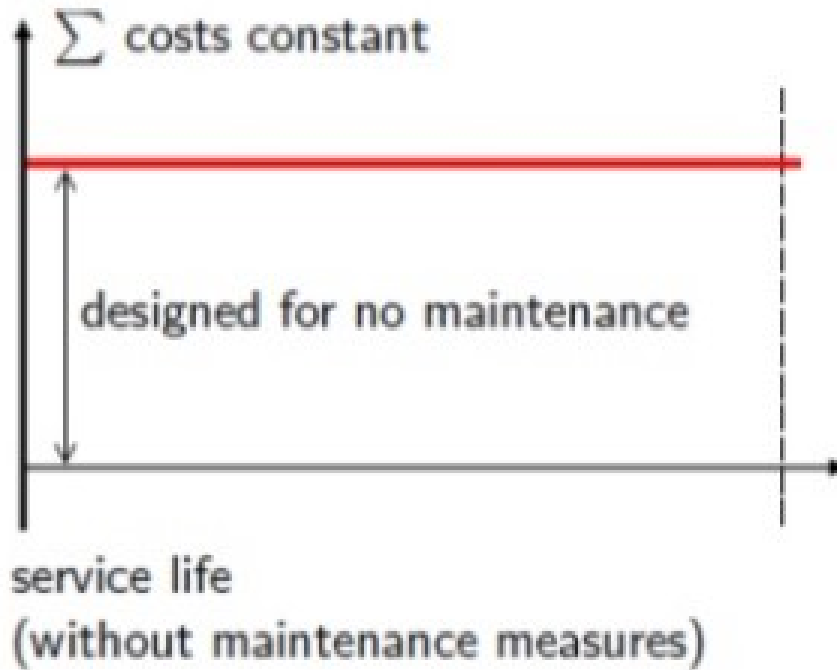
# Safety Reduction



# Analysis & Design



# Economical cost



# Concluding Remark

## Life Cycle

Structure Deterioration:

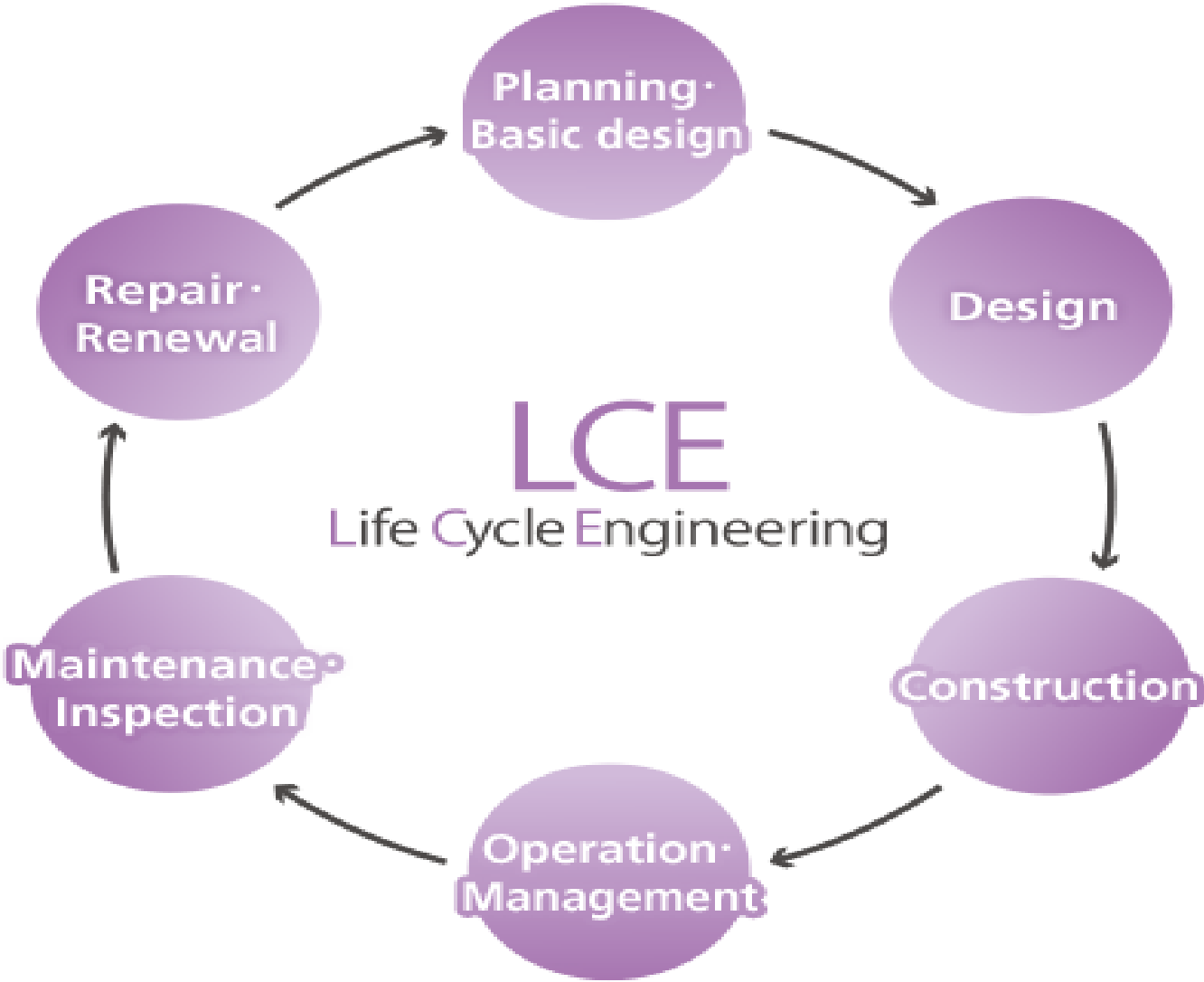
- Fatigue
- Cracking
- Corrosion

## Design

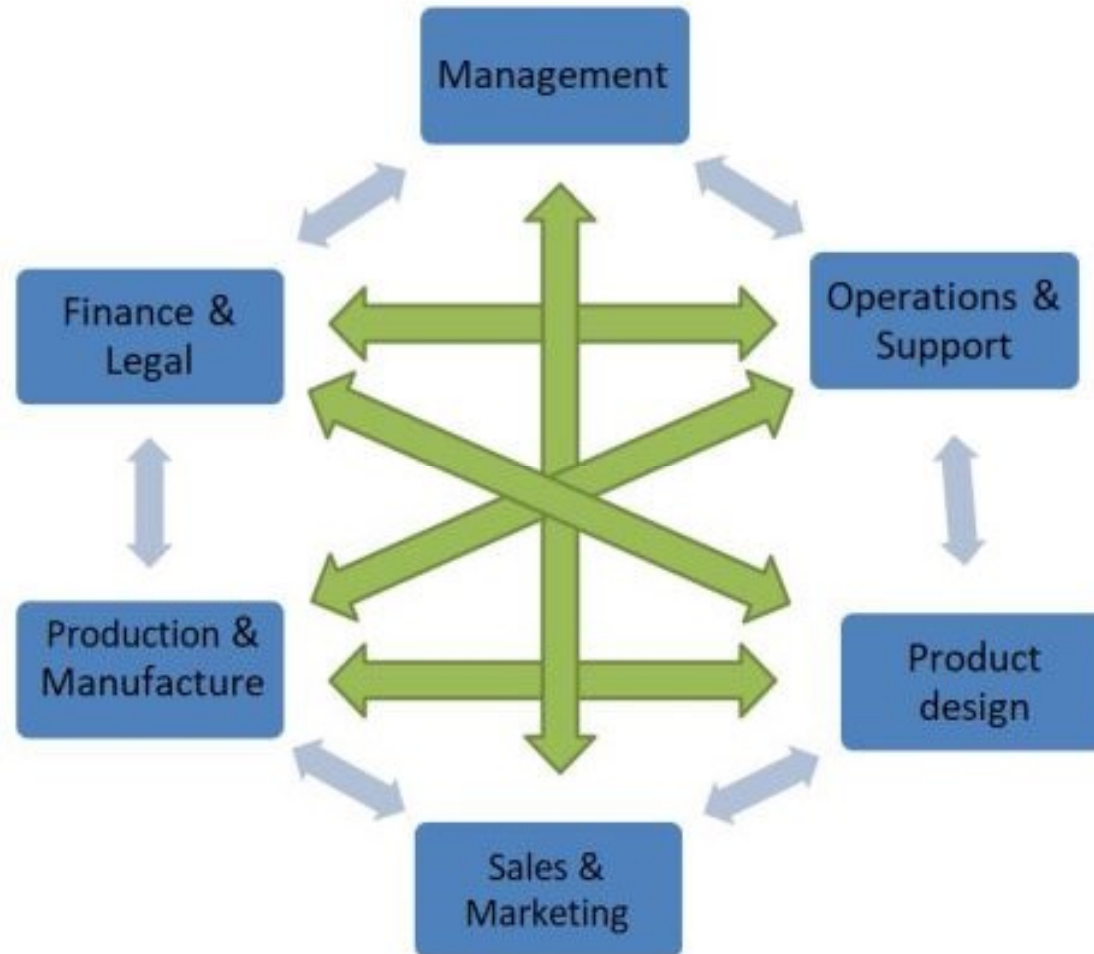
- Efficient
- Economical Flexibility
- Durable and Reliable



# Life Cycle Engineering



# Concurrent Design engineering



# Decision making model

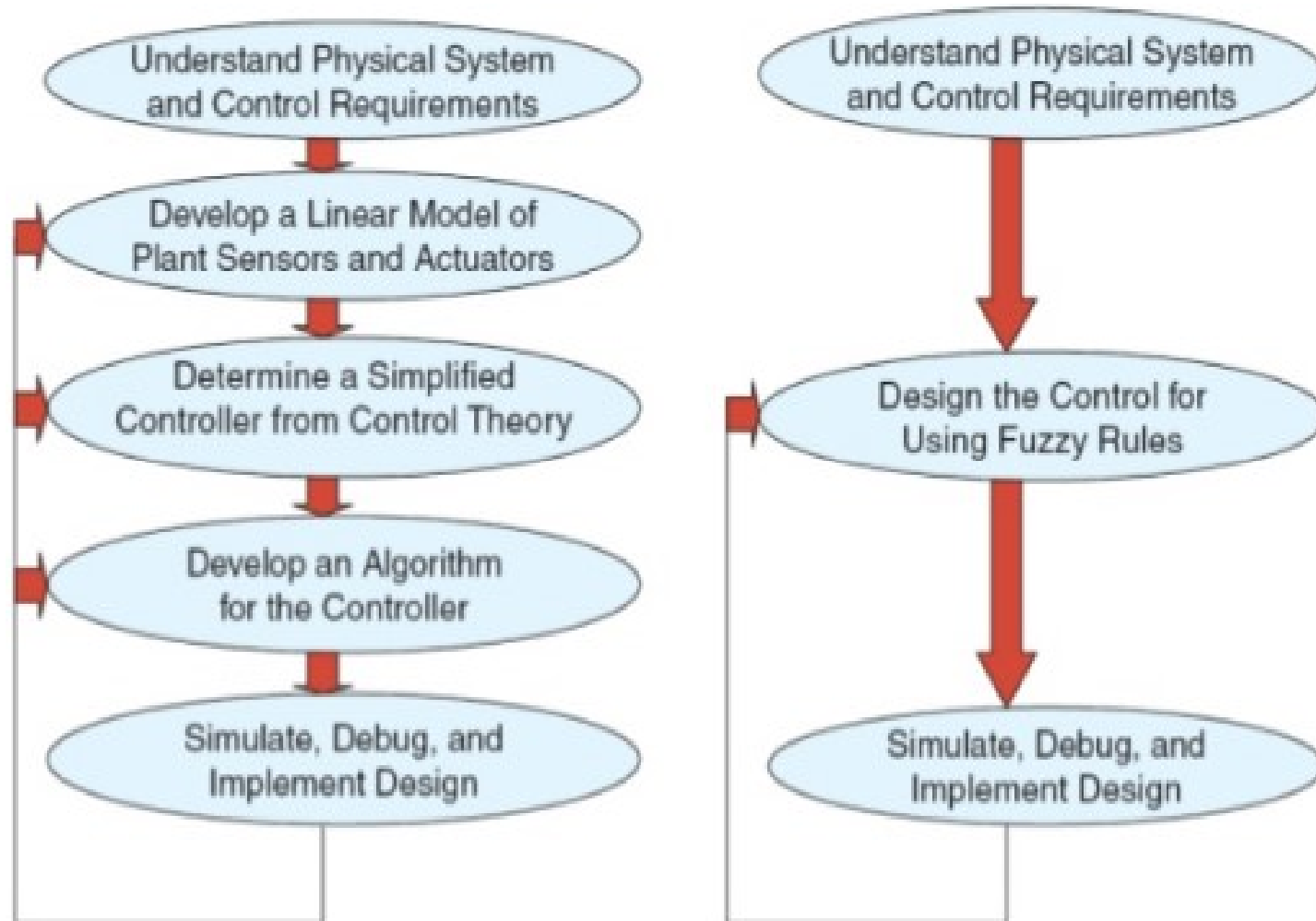
- ❖ Decision under certainty
- ❖ Decision under uncertainty
- ❖ Decision under risk
- ❖ Decision under conflict

# Decision making process

- Step 1 • Identify the problem
- Step 2 • Diagnosing the problem
- Step 3 • Discover alternative courses of action
- Step 4 • Evaluate alternatives
- Step 5 • Select the best alternatives
- Step 6 • Implementing and follow up action



# Fuzzy decision making for LCD



**THANK  
YOU**